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| THOMAS, KAYDEN, HOSTEMEYER & RISLEY LLP | | | EXAMINER | |
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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/810,965
Filing Date: March 26, 2004
Appellant(s): CHEN ET AL.

Daniel R. McClure
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed December 26, 2006 appealing from the Office action mailed April 24, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

| | | |
|-----------|--------------|---------|
| 5,795,818 | Marrs | 08-1998 |
| 5,977,632 | Beddingfield | 11-1999 |

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Initially, and with respect to Claim 29, note that a "product by process" claim is directed to the product per se, no matter how actually made. See *In re Thorpe et al.*, 227 USPQ 964

Art Unit: 2814

(CAFC, 1985) and the related case law cited therein which make it clear that it is the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that, as here, an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not.

As stated in Thorpe,

even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. *In re Brown*, 459 F.2d 531, 535, 173 USPQ 685, 688 (CCPA 1972); *In re Pilkington*, 411 F.2d 1345, 1348, 162 USPQ 145, 147 (CCPA 1969); *Buono v. Yankee Maid Dress Corp.*, 77 F.2d 274, 279, 26 USPQ 57, 61 (2d. Cir. 1935).

Note that Applicant has burden of proof in such cases as the above case law makes clear.

4. Claims 29, 31, 37-38 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Marrs (5,795,818).

As to claims 29 and 37-38, Marrs discloses a solder bump for interconnection of a flip chip device comprising a semiconductor surface 501 (fig. 8, col. 8, lines 19-20), a passivation layer 601 (fig. 8) over said semiconductor surface 501; at least a contact pad 501B (fig. 8) created over the semiconductor surface 501; the passivation layer 601 exposing said at least one contact pad 501B; an UBM 502 (fig. 8) created over the at least one contact pad 501B (fig. 8), a lateral dimension of the UBM layer 502 being limited to be within lateral dimension or being limited to a size approx. the same as lateral dimension of the at least one contact pad 501B; and at least one solder compound 312 (fig. 8) overlying the UBM layer, wherein the solder compound comprises a flat top (fig. 8) surface and convex sidewalls (fig. 8), wherein the top surface is greater than the bottom surface (fig. 8) before connecting to other components. Note that the substrate 501 is made of silicon material which is a semiconductor material (col. 8, lines 19-20).

Art Unit: 2814

As to the grounds of rejection under section 103(a), how the top surface and the bottom surface are size, either before or after connecting to other components, pertains to an intermediate process step which does not affect the final device structure. See MPEP § 2113 which discusses the handling of "product by process" claims and recommends the alternative (§ 102 / § 103) grounds of rejection.

As to claim 31, the UBM layer 502 (col. 9, lines 5-10) comprising a plurality of sub-layers of different metallic composition.

5. Claims 30, 32-34, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Marrs, as applied to claim 29 above, in view of Beddingfield (5,977,632).

Marrs discloses a solder bump for interconnection of a flip chip device comprising a semiconductor surface 501 (fig. 8), a passivation layer 601 (fig. 8) over said semiconductor surface 501; at least a contact pad 501B (fig. 8) created over the semiconductor surface 501; the passivation layer 601 exposing said at least one contact pad 501B; an UBM 502 (fig. 8) created over the at least one contact pad 501B (fig. 8), a lateral dimension of the UBM layer 502 being limited to be within lateral dimension or being limited to a size approx. the same as lateral dimension of the at least one contact pad 501B; and at least one solder compound 312 (fig. 8) overlying the UBM layer, wherein the solder compound comprises a flat top (fig. 8) surface and convex sidewalls (fig. 8), wherein the top surface is greater than the bottom surface (fig. 8) before connecting to other components. However, Marrs does not explicitly teach that the UBM has a layer of chromium followed by a layer of copper followed by a layer of gold.

Beddingfield discloses an analogous device having an UBM 22, 24 (fig. 5) comprising a layer of chromium followed by a layer of copper followed by a layer of gold (col. 3, lines 48-51),

Art Unit: 2814

wherein the UBM is positioned over the passivation layer 16 and at least one contact pad 12 (fig. 5).

Therefore, as to claim 30, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the invention of Marrs with the UBM has a layer of chromium followed by a layer of copper followed by a layer of gold, as taught by Beddingfield, so as to protect against the corrosion of the aluminum pads (col. 3, lines 45-50).

As to claim 32, Beddingfield teaches the passivation layer has a plurality of passivation layers 16, 18, 20 (fig. 5).

As to claim 33, Beddingfield teaches the plurality of passivation layers 16, 18, 20 (fig. 5) are photosensitive polyimide (col. 3, lines 5-10).

As to claim 34, Beddingfield teaches the at least one contact pad 12, 13 (fig. 5) being electrically connected with "a" semiconductor device with at least one conductive line of interconnect or with one conductive contact point (fig. 5)

As to claim 36, Beddingfield teaches that a seed layer 18, 20 (fig. 5) is deposited over the patterned layer of passivation 16 (fig. 5).

(10) Response to Argument

Appellants' arguments in the appeal brief state that the present invention differs from Marrs reference, because the present invention claims a "solder compound" structure, whereas Marrs' invention is a "bump" structure. Appellants cite a passage (col. 10, lines 23-24) in Marrs teaching that the bonding contact (weld) 801 is not susceptible to melting as solder to allege that Marrs' bump is not a "solder compound" as claimed and that Marrs does not use a solder. However, appellants appear to misinterpret Marrs' passage, because the passage teaches the

Art Unit: 2814

bonding contact 801 between the bump and the UMB layer using weld or welding. Doing so, Marrs does not need to use additional solder or epoxy material to bond the Bump to the UMB layer (col. 10, lines 15-20).

In short, Appellants' arguments are not persuasive because of the followings:

1. Marrs' "bump" is the same structure as Appellants' "solder compound" because appellants use the term(s) "bump" or "solder bump" in many instances throughout the disclosure to refer to the same structure (see specification, page 19, lines 19-20 (..solder bump..); page 22, lines 10-12 (...more solder can be deposited to create a larger bump..."); page 23, line 3, line 4, lines 6-7, line 12 (.."bump..."); etc.

2. Marrs teaches a bonding contact using weld or welding. By using weld or welding, Marrs does not need to use additional solder or epoxy material to bond the bump 312 to an UMB layer 502 (col. 10, lines 15-20). However, the bonding contact in Marrs is NOT the same structure as the "solder compound" in applicants' claim. Appellants' claimed structure is essentially a bump, which is the same bump 312 in Marrs. Appellants' bump is made of metal. Marrs' bump is also made of metal. Applicants' UMB layer is made of metal or gold. Marrs' UMB layer is also a metal or gold.

3. Therefore, among other elements as claimed, Marrs meets all of the limitation of the present invention as stated in the rejection.

Regarding to the rejection of Marrs in view of Beddingfield, appellants' argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within

Art Unit: 2814

the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Regarding appellants' comment about the finality of the previous action, the examiner has applied it properly because appellants' amended claims are not cosmetic. Deleting a phrase and then inserting the phrase in different portion of a claim changes the structure or step process of the claim. For instance, claim 1 deleted the phrase "before connecting" which modified the sidewalls structure. Then, the phrase was inserted after the bottom surface structure. This changes the concept of the invention which is substantial to the interpretation of the claim. Thus, appellants' amended claim 1 is not just a mere cosmetic approach. Therefore, the examiner asserts the finality of the previous office action properly.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,



(Vikki) Hoa B. Trinh

Conferees:

Wael Fahmy, Supervisor



Ricky Mack, Supervisor

